

## Abstracts of articles

### TECHNOLOGIES AND MECHANIZATION MEANS IN AGRICULTURE

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#### ASSESSMENT OF THE EXPIRATION ACTIVATOR INFLUENCE FOR PRODUCTIVITY OF THE DISK AND PIN SOWING DEVICE

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Keywords: productivity, seeds, disk-pin, meter, apparatus, activator.

The aim of the research is increasing the performance of the sowing unit disk-pin through the use of the activator expiration of seed from the hopper. The most important device of any seeder is the sowing device. He has to create uniform stream of seed material with the set parameters. When dosing seeds of cereal herbs ensuring compliance with this condition is extremely difficult. The special sowing device is developed for dispensing of seeds of a meadow grass and mix of herbs which part they are. Feature of this device is existence of the activator of the expiration of seed material from the bunker providing steady filling with space seeds on the dosing disk that allows to receive high quality indicators of seeding. An assessment of the activator influence of the expiration for productivity of dispensing of meadow grass meadow seeds both seeds of fodder mix of herbs and determination of optimum design data of the activator were made on the laboratory installation were described in article. When carrying out pilot studies limits and intervals of the following factors variation were set: amplitude and frequency of activation. Height of upper-disk space of the sowing device and an initial departure of mobile pins were accepted by constants. Graphic dependences of specific giving seeds of meadow grass meadow the expirations corresponding to various designs of the activator are presented in article. The analysis of the obtained data as a result of which it is found out is made that the smallest gain of productivity gives application of activation in the middle of loading opening of the device. The maximum productivity characterizes the sowing device equipped with the activator with two waves 6 mm high equidistant from the beginning and the end of a zone of loading. Application of activation of the expiration gives the chance to increase productivity of the disk and pin sowing device for 56%.

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Keywords: cultivator, vibrations, support stand, move, controller.

The purpose of researches is increasing uniformity of cultivator working body depth course and also expansion of operational opportunities of use of a cultivator with elastic racks on soils with different physicommechanical properties. Big energy consumption when processing the soil causes search of ways of its decrease. One ways is use widely – the gripping combined cultivators with working bodies fixed by means of elastic racks. The main types of elastic racks are considered. Application of elastic racks leads to reduction of traction resistance by 25-30% in comparison with working bodies on rigid racks. However use of elastic racks leads to non-performance of agrotechnical requirements. Proceeding from research objective the task – to define was set own frequencies and movements are resistant on an axis of «Z», characterizing depth of the course of working body, depending on loading and the scheme of fixing. For object of research the S-shaped rack was chosen. Calculation of rack oscillatory process was carried out in the computer SolidWorks program which is based on a method of final elements. At calculation the maximum load of one rack got out taking into account the specific resistance of the soil and was accepted for 2500 N. An interval of loading change – 500 N. As a result, calculation dependences were constructed: «loading – movement» and «own frequencies – schemes of fixing». The analysis of these dependences showed: all dependences are expressed by straight lines, that is tension in rack doesn't exceed proportionality limit; with increase in reference points rigidity of rack increases; with increase in rigidity of rack its own frequency grows. It is revealed that for stabilization of effective indicators of work of executive part of working cultivator, it is necessary to provide the rigidity regulator that allows to use it for soils of various humidity and hardness in its design.

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Keywords: mixer, looping, mixing, upload, mix, performance.

The purpose of the study is to analytically justify the cycle of mixer periodic action operation. Livestock productivity improvement requires improvement of feed quality. One way to improve the quality of feed is the preparation of mixtures. The highest quality compounds provide mixers of periodic action. Their feature is preloading the components of the mixture and the subsequent period of the screed mixing. After preparation of the mixture discharge opening opens and the finished mixture is discharged. In some cases, used mixers step mixing, which is prepared at the beginning of pre-mixture, reloads additional supplements and it turns out the mixture, sometimes several similar stages of mixing. The article gives a description of the developed design vertical paddle mixer periodic action for the preparation of feed mixtures. Using known theoretical principles of applied mechanics, analytically derived expressions of the duration of mixing of the mixture components and unloading of finished feed from the mixer. Unloading feed from the mixer can be divided into two intervals of time. The first interval until mixture is discharged above the discharge aperture (height of the discharge aperture constant). The second interval when the mixture is discharged at the height of the discharge aperture (height of the mixture varies from the height of the discharge aperture to a practical zero, i.e., the height of the discharge aperture variable). The article theoretically grounded expression of the cycle time of the mixer including mixing time and discharge vertical mixer. Presents formulas for determining the duration of mixing, time of discharge of the material through the rectangular side opening and the full cycle time.

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Keywords: extrudate, plant, raw, humidity, thermal vacuum, exposure.

The purpose of research is theoretical justification thermovacuum effect during processing of plant origin raw materials with a modernized extruder. Processes thermoplastic extrusion plant raw materials have been widely used in the manufacture of prepared meals; extruded cereal intermediates for use in confectionery technology, bread and meat products; feed different groups of animals, poultry and fish. Most of these products are extrudates porous macrostructures obtained by processing raw materials rich in starch. Get these extrudates using machines equipped with short uncooled die at the exit of which the treated material is a sharp collapse, cause explosive evaporation of water and formation of a porous macrostructure. The evaluation process of evaporation of moisture in the preparation of extrudates, the greatest difficulties arise when considering the transfer of fluid in a superheated state and then knock him boiling, which is defined as an avalanche education centers in the amount of superheated boiling liquid and its rapid evaporation. In addition to the explosive evaporation of free water moisture content of the extrudate is reduced by drying by convective mass transfer. Based on the equation of Fick's first law and the ideal gas law and the theory of similarity, a calculation of the convective mass transfer of moisture in the extrudate receiving conditions at atmospheric pressure to the ambient air and under reduced pressure of air in the vacuum chamber upgraded extruder. The rate of evaporation of moisture from the extrudate using a vacuum chamber is increased approximately 30 times, which justifies its use in order to intensify the formation of pores in the finished product and its dehydration.

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#### ENERGY PERFORMANCE OF DM «FRIGATE» RAINER

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Keywords: rain, machine, rainer, watering, power.

The purpose of the study is improving the efficiency of using DM «Frigate» by reducing the energy impact of rain. In Saratov Zavolzhye irrigation allows 2-3 times to increase the productivity of agrocenoses. Along with a positive effect from melioration it is necessary to pay attention and to deterioration of an ecological situation in places of use of dozhdevalny equipment. Development of such negative processes as rise in level of ground waters, secondary salinization, a water erosion happen because of use of the rain equipment possessing the increased impact on the soil owing to the considerable height of raising of a cumulonimbus cloud, the increased fineness of drops of a rain, high intensity of a rain. When determining norm of watering to a drain design and technological data of the serial and modernized rainer of DM «Frigate» were fixed, and also the type and mechanical structure of the soil, a type of crops, soil covering degree were considered by plants. The norm of watering to a drain of Mds decreased with increase in a bias of a field, preirrigation humidity and consolidation (volume weight) of the top layer of earth (in process of increase in frequency rate of waterings). The increase in norm of watering to a drain is promoted by increase in degree of a covering of the soil plants.

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#### THEORETICAL SUBSTANTIATION OF TROSO-SCRAPER CONVEYOR FEEDING MACHINE PARAMETERS

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Keywords: conveyor, transportation, bulk, materials, feed, drag-rope.

The purpose of the study is to substantiate theoretically the basic parameters of the feeder scraper-cable conveyor. For transportation of bulk cargoes, including grain and products of its processing, it is widely being utilized cable-scraper conveyors with crocoseum or arc-shibolim working body. Effect operation instructions for operating characteristics and great traction capacity of the cable, this working body has significant advantages. One of the drawbacks of these working bodies is the formation of plugs of material in front of the moving scraper. It leads to increase in resistance when moving the working body. This drawback can be reduced by optimizing the design of the washer conveyor. To optimize the design of the working body of the scraper-cable conveyor theoretical research, allowing calculation of the basic indicators of work of the conveyor with such a working body. The article describes the scraper rope conveyor continuous stationary feed mixer dry food. The pipeline consists of three sequential processes: loading material in materialpipe, moving material throughout the length of transportation, unloading of the material under its own weight through discharge opening in the bottom of the pipe materialpipe. The results presented and substantiated theoretically the shape of the bowl of the scraper in the form of a hemisphere with the angle of the guide pipe is not less than the

angle of friction of the material of the wall of the bowl, and also the expression that allows to calculate the main parameters of the scraper rope conveyor.

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**Keywords:** roots, tubers, chopper, knives, energy, power, performance.

The purpose of the study is to analytically justification based on the definition of the basic indicators of disk cutter chopper roots work. The increase in dairy cows productivity requires improving the quality of feed, as well as the inclusion in the composition of the diet of roots and tubers. One of the mandatory preparation of crops for feeding is fragmentation and the subsequent feeding of animals in the shortest time (up to 2 hours), to prevent damage. For grinding crops are the trowel, the hammer-wrought, pin, knife, etc. grinding machines. Most preferred, for the grinding of clean roots is a disk cutter grinding machine with horizontal axis of rotation. Effect characteristics of chopper in operation farms, it is assumed manual loading of root crops in the chopping apparatus. To improve performance, we propose an original feed device. Describing the disk chopper crops for farms with original over-bulky device that provides forced supply of the root to the blades of the disk, increasing productivity. Excessive contact force will result in excessive compression of disk the root and increase the intensity of the process. The thickness of the slices is limited by the limb of a knife from the plane of the disk surface. If you looked around enough effort root does not reach the disk, and accordingly the thickness of the slice is smaller, the performance of the device below, and the effective energy intensity of the process is reduced. Therefore, the theoretical analysis of the working process will define its basic parameters. The article gives theoretical justification and leads to the given expression describing the intensity of the process, drive power, the performance of the device, the thickness of the roots particles slices.

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#### OPTIMIZATION OF MACHINES FOR FERTILIZER ACCORDING BIOLOGICAL AND TECHNOLOGICAL CROPS PARAMETERS

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Keywords: biology, roots, technology, options, plants, tillage, fertilizer, aggregates.

The conducted studies are experimental and theoretical study of optimum dis-position of the working bodies with the improvement of their design for example, experienced a combined soil-cultivating-fertilizing unit «Pegasus» (firm «Amazone-Werke», Germany, Samara) for intersoil, volume (bunk) application of mineral fertilizers. If you bunk the location of the working bodies in the transverse plane, the first row is equipped Lancet working bodies, second row – Ripper paws with manureproviding system that surround the application of mineral fertilizers in two tiers of 120-150 mm and 270-300 mm without a significant increase in traction resistance unlike bunk accommodation only Lancet paws. The results of modernization combined aggregate «Pegasus» within the parameters of the zone of maximum position of the roots of agricultural crops (40-90 cm) in accordance with the biology of their development provide optimal conditions for effective growth and maximum yield. Three cases of destruction of the soil working bodies with the formation of the deformed zone was investigated – zone placement of mineral fertilizers. Specially developed technique for qualitative assessment of the placement of mineral fertilizers and replacing them with white plastic balls allows you to control the process of optimization of parameters of working bodies. Conducted research as directed on modernization of existing and creation of the new combined tillage-fertilizer units with maximum efficiency for the development of crops and increase the yield because the recommendations are based on the placement of workers to work in the area of the root system of plants in their seasonal vegetation starting from germination receiving additional power from the fertilizer of the first tier, until the final vegetation is of a crop formation with the additional power of the root system from the fertilizer of the second tier. From subsurface fertilizer application, the yield of sunflower (seeds) increased by 16%, maize (green mass) – up to 10%. Bunk bulk fertilizer additionally increases crop yields by 10-20%.

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#### DEVELOPMENT OF PNEUMATIC SOWING MACHINE SEEDER FOR AMARANTH LOW APPLICATION SOWING

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**Keywords:** inoculation, amaranth, pneumatic, sowing, machine, seed, dispensing, quality.

The purpose of the research is improving the quality of dispensing amaranth seeds small norms in the development of pneumatic sowing machine. Qualitative performance of seeder for small seeded crops depend on the sowing unit, as technical means for dosing and feeding the seed flow. Designed pneumatic seed metering device for dispensing seeds of small seeded crops seeding rates of 0.1-1.5 kg/ha. Novelty design of the sowing unit is confirmed by the patent of the Russian Federation for the invention №2228586. Laboratory studies have found that at values of air velocity at the inlet to the mixer  $V = 13.46$  m/s and mounting height ejector device over the mixer  $h = 0.147$  m observed the best uniformity of distribution of seeds in subejectorspace. The coefficient of variation of the distribution of seeds on the front of the seed-air flow amounted  $v = 44.08\%$ . The coefficient of variation of the distribution of intervals between plants along the row amounted in experimental seeders  $v = 63.3\%$  and the seeder SO-4.2  $v = 131\%$ . Due to a better distribution of plants on the area of the field, the seed yield of green mass on plots sown with seed drill with pneumatic sowing machine was exceeded by 44 and 34.7% respectively, the yields from the control plots and averaged over the three years of 1.25 t/ha of seeds and 87.74 t/ha of green mass.

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#### DETERMINATION OF IMPACT PNEUMATIC PADDLE WHEELS VEHICLE DEGREE OF TRACTORS AND MACHINES WHEN WORKING IN IRRIGATED FIELDS

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**Keywords:** mover, density, soil, volume, seal.

The purpose of researches is reducing the impact of propulsion of machine-tractor unit for irrigated soil. In studies of the interaction of pneumatic propulsion irrigated soil presents Ana-lytic determine the dependence of the contact pressure arises in the soil



during Pro-stroke pneumatic wheel machine-tractor unit. On the basis of experimental data the coefficients characterizing the physico-mechanical properties of soils, namely irrigated soils  $a = 0.054$  and  $b = 3.453 \cdot 10^{-3}$ ; for non-irrigated soils  $a = 0.021$  and  $b = 0.982 \cdot 10^{-3}$ . The analytical dependence of the determination of the volume of compacted soil situated between soil attachment according physico-mechanical properties of different soils, geometrical parameters, and the mode of movement of pneumatic wheels. The mathematical model of the variation of the complex index of soil characterize the determination of the degree of influence of the pneumatic wheels on the ground. A comprehensive index of the soil is assessed qualitative characteristics of the soil changing the exposure process pneumatic wheels on the ground. Assessment of the negative impact of the wheel on the ground is carried out on the basis of changes in the qualitative characteristics of soil and their quantitative ratio. Performance the results of experimental studies of tractor K-701 with tires F81(86) moving with a maximum hook load of unirrigated soil is a heavy loam with wet-STU 18-19% and the irrigated soil is a heavy loam with a moisture content of 24-25%. The results showed that the increase in speed of 2 to 10 km/h leads to a twofold HC-treatment coefficient of slipping for both types of soils, however, the coefficient of slipping on irrigated soils, on average, 13.3% higher compared with non-irrigated soils.

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#### RESULTS OF STRUCTURAL HEAT-RESISTANT MATERIALS FOR THE MANUFACTURE CYLINDER HEAD

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**Keywords:** heat resistance, stress, deformation, fatigue, crack.

The purpose of researches is improving the heat resistance of the material of the cylinder head (cylinder head), the rationale of the chemical composition and structure of this part. Under low-cycle thermal loading occurs gradually relaxation of thermal stresses in the presence of already formed permanent deformation. This causes tensile stresses are particularly dangerous for grey cast iron used to manufacture the cylinder head. The tensile strength of the material in tension is several times less than in compression. Each thermal Cycling, the tensile stress will increase, as gray cast iron has low plasticity. Residual deformation will increase and will eventually lead to thermostatical cracks. The material of the head, cast iron SCH25, has a graphite inclusions plate shape. The structure of the material is not optimal for improved heat transfer, which also increases thermal stresses on the surface and the thickness of firing the bottom and leads to cracks. This defect limits the resource of the cylinder head. For the rational choice of the material of this part was used in the experimental setup. Based on the analysis of the results of the studies, it was found that the maximum thermal resistance, 160 cycles, has vermicular cast iron. Increased thermostability show cast irons with such alloying elements as copper, Nickel, molybdenum. Found that the use of dopants optimal chemical composition and structure of vermicular cast iron will significantly improve the durability of the cylinder head.

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#### JUSTIFICATION SEED FEED BYREEL-PIN SOWING UNIT

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**Keywords:** sowing, machine, pin, reel, reel-seeding.

The purpose of research is improving the uniformity of seeding reel-pin sowing apparatus. Pin sowing machines worked well when sown crops as an alternative to the traditional reel-grooved sowing apparatus. At relatively high uniformity of seeding, the device of this type is observed pulse influence pins on the flow of seeds. This is due to the relatively slow fill the empty space, which is formed after the passage of the pins through the grain mass and the emergence of the seal area of seeds before pins. To solve this problem has been developed reel of pin sowing unit with asynchronous movement of the pins. After defeating the coil discs and giving them different speed, there was a division of the total flow of seeds into three streams. The speed of the main stream at the same time become less extreme speed flows. Interaction of streams are reduced to their mixing and thus greater space filling, after a pin. The main requirement for the seeding apparatus is to provide the desired seeding rate that directly depends on their submission. The actual supply of the sowing is always less than the theoretical maximum feed, due to the influence of factors such as rubbing the seeds of the elements of the design of the device, incomplete filling into shift space and sliding seeds of pins. Maximum theoretical flow is defined as the sum of the mass of seeds sown are in into shift space and weight of the seeds sown the active layer. Weight of seeds sown into shift space is defined as the sum of the masses of seeds sown separate drive pin. Weight of seeds sown active layer is also defined as the sum of the masses of seeds sown streams active layers beneath the bayonet disk. It was found that the basic design parameters sowing apparatus affecting supply are: the diameter and width of the disc size and the number of pins, and the distance from the valve to the ends of the pins. The main process parameters are the speed of the central and side discs.

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#### ESTIMATION OF AUTOMATIC REGULATION SYSTEM ACCURACY PARAMETERS OF DIFFERENTIAL FERTILIZER ON THE INS PLATFORM

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Keywords: theoretical, analysis, automatic, control, accuracy, agriculture.

The purpose of the study is to improve the quality characteristics of traded agricultural machines with their further improvement and design. The uneven distribution of mineral different doses as a different effect on yield losses. When making optimal dose of yield loss from uneven fertilizer sieving increase as a result of a shortage on under-fertilized plots, as well as due to lodging of plants on plots that received excessive dose of nutrients. Thus the problem of providing accurate driving units for fertilizer is further exacerbated with increasing width of modern high-performance high-tech equipment. The system of differential fertilizer created on the platform of an inertial navigation system (INS), as an alternative to GPS navigation in the system of precision farming will allow lower cost and greater accuracy to perform agricultural operations for fertilization. In appointing the accuracy requirements of regulation was justified the length of the interval for which should be a given accuracy. As the theoretical assumptions of the analysis of the quality of regulation when exposed to stochastic perturbations  $Q(t)$ , examined the trend deviation of the volume of material in successive portions of the stream at time intervals  $\Delta t$ . An optimal choice from the point of view of the quality of regulation of the working section, was considered subject to the submission to the inputs of the system given function  $Q_{\text{ass}}(t)$  and random signal  $Q(t)$ . Recommendations on the use of converters with small values of time differentiation CD that will allow you to expand the bandwidth  $\omega_n$ . The effective bandwidth will be  $\omega_n = 4\pi/3T$ .

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#### IMPROVING THE DESIGN OF THE SOIL SAMPLER

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Keywords: samples, soil sampler, undisturbed, structure.

The purpose of research is technical means for sampling improvement the soil during field research. The proposed design of the probe allows the authors to take samples of the soil undisturbed. Existing devices for sampling of soil can be divided into devices for selection with the disturbed or undisturbed. On the proposed design the forming concluded sampler sample occurs due to extraction of the device from the soil hole, and the determination of physico-chemical properties can be carried out simultaneously with taking soil samples. On the collapsible body composed of two halves, set the container, based on the front end internal shoulder collapsible body. At the rear end of the container lid secured with pins outwardly through the slots missing wall of the body, and the latter is put on the flange adjacent the rear surface of the pins. On the body set pusher, between which and cover the spring is installed. On the annular groove collapsible enclosure facing the front end of the container stacked two cutting strings, one for each half of the collapsible body. With the introduction of the probe into the soil pusher latter fills the container, and when pulling the strings cut cutting pusher soil sample at the bottom of the container and ensure removal of the probe. Along with taking soil samples is determined its physicochemical properties, for example, soil moisture. For this on sampler set electrode electrically insulated from the housing and cover by textolite sleeves, can be connected to the electrical device. The results of laboratory and field tests have proved that the developed sampler operable, allows to obtain soil samples with undisturbed structure with a volume of 125 cm<sup>3</sup>, can be used to determine dimensional weight, also the direct determination of physical and

chemical properties of soil, such as moisture on electrical performance, using as supply voltage signal current frequency of 100-200 kHz.

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# TECHNOLOGIES AND MAINTENANCE SERVICE MEANS IN AGRICULTURE

UDK 620.179.12

## TRACTOR'S HYDRAULIC SYSTEM EFFICIENCY DIAGNOSTIC CRITERIA JUSTIFICATION

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**Keywords:** hydraulic system, criterion, additive, wear, resource.

The purpose of researches is the rational diagnostic criteria proving tractor hydraulic system efficiency assessment considering features of its basic elements. Proceeding from the purpose of researches the following tasks were set – analytically to estimate rational criteria and methods of separate elements efficiency increase of hydraulic systems and to establish their interrelation; methodologically to prove the direction of an experimental assessment of diagnostic criteria of efficiency of a hydraulic system taking into account improvement of the tribological parameters in basic elements of system. Rational criteria of an assessment of elements efficiency of hydraulic system of the MTZ-1221.2 tractor are proved. It is established that the perspective direction of tractor's hydraulic system basic elements resource increase is use and centrifugal cleaning of alternative plant-mineral lubricant composition (PMLC) with a complex of additives. For an assessment of the PMLC antifrictional properties laboratory researches of influence of graphite (d, C) as antifrictional additive on change of diameter of a wear spot by four-ball friction machine (MAST-1) are conducted. As a result of processing of results of researches the equation of regression is received and the response surface characterizing influences of concentration C and diameter of graphite particles d on change of diameter of a wear spot  $D_w$  is constructed. Rational values of concentration  $C = 0.75\%$  are determined by weight and the size of particles of  $d = 10-30$  microns of graphite as a part of lubricant composition. Basic researches established increase of a resource of interfaces of basic elements of tractor hydraulic system to 15-20% when using alternative PMLC on the basis of rape oil in a complex with the additive batcher at the corresponding decrease in ecological impurity of the soil. The methodology of a choice of the main diagnostic criteria of hydraulic system is proved.

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## RELIABILITY INCREASING OF LOADED DEVICES SUCH AS «DC MACHINES – THYRISTOR CONVERTERS» DURING THE POWER AUTOTRACTOR ENGINES TESTING

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**Keywords:** diesel, engine, test, stand, thyristorable, inverter, machine.

The purpose of research is improving the reliability of the loading device of the «dc machines – thyristor converter» during the testing of high-power automotive engines. To achieve this goal a method and apparatus for protection and diagnostics of series-connected thyristors have been developed. In this method, as the protective effects of the feed of the control pulses and monitor the condition of the thyristors on the reverse voltage and the operating temperature of the coolant valve. Oversees the serviceability of communication lines with the system pulse-phase control of reverse response, measurements of reverse voltage distribution in each cycle valve groups. Exceeding the maximum allowable temperature of the thyristors or reducing the nominal value of reverse voltage distribution, or loss of communication with the IFSB produce a protective effect by removing pulses from all thyristor groups thyristor converter disconnecting from the network. Then, with the help of the measured distributions analysis produced reverse voltage and the operating temperature of thyristor, warn of crashes thyristor valve due to the degradation of its characteristics. Because of this, the proposed device and method can improve diagnostic and protective properties of the thyristor converter, which undoubtedly attracted to improve the reliability of the loading device of the «dc machines – thyristor converter», and, therefore, of the break-in, the brake tester.

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## VORTEX HYDRAULIC HEAT GENERATOR WITH IMPROVED CHARACTERISTICS

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Keywords: heat generator, vortex, effect, heating, system, intensification, energy, conversion.

The goal of the research was to create an environmentally friendly heat generation device with improved performance characteristic. To achieve this objective was established installation – «Vortex hydraulic heat generator» (VHHG). This device generates heat due to changes in physical and mechanical properties of the liquid. Performance gain is achieved by the intensification of energy conversion processes by making the heat generator's body in the form of axially extends from the entrance to the bottom vessel with longitudinal cylindrical grooves. The grooves are evenly spaced around the circumference of the heat generator cross section. To carry out the tests were made experimental stand and two heat generator models (with nominal and improved characteristic). Comparison of the results of their work showed that the heat generator with improved characteristic heats the water in the heating system to a temperature of 3-4°C higher than the heat generator with the nominal parameters. Heat generator effectiveness is increased by an average of 5%. The use of the heating system on the basis of vortex hydraulic heat generator with improved characteristic suitable for the creation of compact and economical heating systems of agricultural areas in the winter season. For example, for heating barns and underfloor heating in the crib for lambs.

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#### ANTIWEAR PROPERTIES OF GEAR OILS AND GREASES INCREASING

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Keywords: wear, bearings, gear, oil, grease, modification, nanoscale, powders.

The purpose of research is improving the antiwear properties of the transmission oil TSP-15k and grease Litol-24 through modification of nanosized powders (NSP), obtained by the method of plasma precondensation. Transmission oil modified nanosized particles of tin bronze in combination with PTFE, boron nitride, phosphorus and alumina. Antiwear properties of the grease has improved NSP of nickel, iron, zinc, and alloys of copper with tin, of copper with lead, of aluminum and lead, of iron with nickel and of iron with zinc. Based on the results of laboratory tests established that nanosized particles of tin bronze in combination with PTFE, boron nitride, phosphorus and aluminum oxide can improve antiwear properties of the transmission oil TSP-15k from 1.5 to 2.5 times. The best results recorded in the test lubricant compositions are obtained using a combination of NSP of tin bronze and aluminum oxide. The results of the comparative laboratory tests commercial grease Litol-24 and experimental lubricant compositions prepared on its basis using NSP of nickel, iron, zinc, and alloys of copper and tin, of copper

with lead, of aluminum and lead, of iron with nickel and of iron with zinc, showed that the used of nanoscale components improve antiwear properties commercial grease from 1.9 to 17 times. The best results are obtained when using NSP nickel and an alloy of iron with zinc, which is illustrated by a model of the friction pair «disk to disk» allowed to implement restorative effect.

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#### NON-WEAR AND ANTIFRICTIONAL CHARACTERISTICS INCREASING OF PLASTIC GREASINGS BY MEANS OF GRAPHITE PROCESSED IN PLASMA APPLICATION

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**Keywords:** plasma, wear, greasing, additive, graphite

The purpose of the research is the indications tribological serial plastic greasings improvement on the basis of lithium, used in knots of a friction of agricultural machines. This work is devoted to the results of experimental researches antifrictional and non-wear properties plastic greasing with additives in the form of the graphite modified plasmachemical by a method. For modifying graphite were used two types of the category: underwater diaphragm the category and the decaying category of atmospheric pressure. As a result of plasma activation there is a modifying of a surface of the graphite, the resulting, in particular, to change of its properties. Superficial modifying is caused by action of components plasmachemical the category. Plasma initiation in a solution leads to generation of active particles, Uf-radiation, and also to mechanical activation of a solution. Arising in volume transmission of energy streams promote fast carrying over of active particles and reagents to a liquid phase. Thus, active particles, co-operating with a graphite surface change its characteristics. As a result of modifying the charge on a graphite surface changes and its wettability improves. Tribological researches have been executed on a friction machine. Researches have shown that introduction as additives to greasings on the basis of lithium the of the graphite modified plasmachemical by a



method allows to lower friction coefficient in 1.95-2.67 times that as a whole allows to reduce losses on a friction in tribological connection. Wear of friction pairs elements decreases in 1.25-1.64 times, that allows to increase further a resource of details a friction pairs of agricultural machines and the equipment. Researches show that use for modifying of graphite of plasma of the underwater diaphragm category is perspective. Use of plasma of the decaying category of the atmospheric pressure lighted over a surface of a liquid to considerable improvement tribological of characteristics has not resulted. The received results show perspective graphite modified plasmachemical by a method at use as antifrictional and non-wear additives to plastic greasings on the basis of lithium.

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#### SCHEMES CREATION FEATURES OF ELECTROMECHANICAL ENERGY SAVING STANDS FOR AUTOTRACTOR DIESELS TESTS

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Keywords: engine, diesel, asynchronous, tire running, stand, converter.

The purpose of the study is the quality of running-in automotive diesel engines improving at the expense of means of applying the design stands regenerative frequency converters with asynchronous motor and energy-efficient modern algorithms for controlling them. Such design of test stands is capable to provide full recovery of electric energy in an industrial network in the mode of a hot running in that promotes increase of power efficiency and decrease in electricity consumption. Besides, the recuperative electric drive provides maintenance of the moment and speed relatively each other in all operating modes and promotes expansion of range of regulation of speed of rotation of the induction motor that allows to increase in the mode of a cold running in of diesels quality extra earnings of the examinee of the engine, beginning smooth running in with low turns (not less than 50 rpm). During research positive and negative qualities of modern designs of brake stands that allowed to estimate the existing problems were revealed and to designate a number of tasks which decision will lead to elimination of problem zones when developing new power effective designs of test benches and modernization of the existing.

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### JUSTIFICATION OF THE MINERAL AND VEGETABLE-BASED FUEL LINSEED OIL OPTIMAL COMPOSITION CHOICE

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Keywords: linseed, mineral - vegetable, oil, friction, tear.

The purpose of research is justification of the mineral-organic fuel optimal composition choice, reduce wear and tear on parts. Determination of the optimal composition of the fuel, reducing tear. A brief analysis of the possible application of linseed oil as a component of the blend biofuels. The theoretical background to reduce tear of critical parts of the fuel through the use of the optimal composition of the mineral and plant-based fuel linseed oil. It is hypothesized to reduce the amount of tear depending on the increase in the concentration of linseed oil in the mineral-plant fuel. The results of laboratory studies of the influence of various compositions of mineral fuels based on vegetable linseed oil to tear, confirming the hypothesis. During the tests, the following parameters were measured: the temperature of the oil in a node of friction, the frictional force and the normal load. Produces a visual inspection of the surface of the friction and tear were measured spot sizes. Tests were carried out five different compositions of fuel in four different load conditions with fourfold replications. The obtained data is stored in the form of graphs and numerical data based on the end of each test. Wear spots to take pictures of each sample. It was lined with the dependence of the amount of tear on the percentage of linseed oil in the mineral – plant fuel. The optimum composition of the mineral and plant –based fuel linseed oil – 25% of LM + 75% diesel fuel. The results of the tests. It was found that the use of the composition of the mineral – plant fuel as the working environment is efficient and reduces the amount of wear scar for at least 6%.

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#### FEATURES OF ELASTIC WAVE INFLUENCE FOR MASS TRANSFER PROCESS IN METALS AND ALLOYS

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Keywords: mass transfer process, metals, radioactive, isotopes, elastic, wave.

The purpose of research – to improve the mechanical properties and surface quality of metal products on the basis of copper, titanium, iron and its alloys. Cylindrical samples with 10 mm diameter and 10 mm height made from pure metal have been exposed the repeated treatment at a pressure of elastic waves to 107 Pa at a frequency of up to 60 pulses per minute in a neutral gas and permeating gas medium. The treatment temperature was varied in the range of 973-1273 K. Method of autoradiography and stratified radiometric analysis with help of device «Beta 1» and using isotopes <sup>63</sup>Ni, <sup>14</sup>C were applied. It was found that the rate of diffusion of nickel into iron, copper and titanium increased to 2 times and besides the concentration profile in titanium is nonmonotonic and the diffusion zone depth exceeded those in copper and iron. The observed acceleration of the process saturation with carbon increase 1.5-2 times at a temperature of 1273 K in 10 times at a temperature of 973 K during carburization iron and its alloys and titanium chromium as a result of treatment. At the same time the phase formation character change and after the pulse treatment of iron surface layer with 40 microns depth contained up to 65% of the austenite. Found that under the pulse compression of the gaseous medium occurs a maximum concentration of carbon, and, respectively, the microhardness maximum occurs, whose position is determined by the processing parameters and the composition of the alloy. Lowering the temperature diffusion annealing increased the efficacy of pulse treatment.

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#### CAMELINA OIL INFLUENCE FOR ANTIWEAR PROPERTIES OF MIXED FUELS

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Keywords: fuel, mixed, pair, properties, antiwear.

Research objective is estimate influence of camelina oil with its use in quality of antiwear additive for tribology properties of diesel fuel. Theoretical prerequisites of mixed fuel due to antiwear properties increase use as additive of the vegetable oils containing organic surfactants are submitted. The technique and results of basic researches of antiwear properties of mixed fuel with additive of camelina oil are given. Researches were conducted on a universal tribometer of the TU type on four-ball frictional unit. Concentration of camelina oil in fuel are changed from 0 to 10% on volume with a step to 2%. Loading, frequency of rotation of a spindle and material of details of frictional unit didn't change. Researches showed that at concentration of camelina oil of 2% on volume the average diameter of a spot of wear decreased by 26.1% (with 1.1255 when using diesel fuel without additives to 0.8317 mm at addition of 2% of camelina oil). At concentration of camelina oil of 4% the average diameter of a spot of wear decreased by 35.94% of the initial. At further increase in concentration of camelina oil (6, 8 and 10% on volume) decrease in diameter of a spot of wear made respectively 36.56; 37.32 and 38.57%. It is established that for substantial increase the tribology properties of diesel fuel is enough to enter into its structure 2-4% of camelina oil on volume. The further increase in concentration of antiwear additive of considerable effect doesn't give, but use the mixed fuels with the content of vegetable oils to 50% on volume is rational from the point of view of economy of fuels of an oil origin.

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#### THE ALGORITHMIC APPROACH USE IN THE MODERNIZATION OF THE TECHNICAL MAINTENANCE SYSTEM AND REPAIR OF ELECTRICAL EQUIPMENT IN AGRICULTURAL PRODUCTION

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Keywords: algorithm, implementation, system, technical, service, repair, electrical.

The aim of the study is to justify the application of an algorithmic approach for system modernization and repair of electrical equipment in agricultural production. The article considers the problem of development modernizing of technical maintenance system and repair of electrical equipment (TM and P) in agricultural production. System and repair of electrical equipment includes a set of interrelated organizational and technological measures necessary to maintain and improve its capacity. Features of operation of electrical equipment in the conditions of the agricultural environment, unpleasant for its operation,

forcing manufacturers to adapt it to existing conditions in the process. To increase the reliability and performance of electrical equipment modifying its construction impossible. Required to be specifically adapted to a particular agricultural production system and repair, for which it is necessary to conduct those activities on modernization of the current system. For modernization, proposed to use the algorithm of realization of maintenance and repair, implementation of which allows to adapt it to the needs of a particular production, and the process of using the system to submit a clear control. Modernization and repair using an algorithmic approach will allow optimize to labor and financial resources of the enterprise, eliminate ballast processes in operations and repair, to give flexibility in system management. The algorithmic essence of the approach is the differential-linzing processes and repair on the levels of implementation. In the framework of the algorithm the implementation of maintenance and repair is proposed to use the technique of positioning, which allows to assess the current state of technical, economic and labour sphere of production, and to develop local policy management and repair and to determine the implementation strategy of this system. Justification of the algorithm implementation maintenance and repair extends the theoretical and practical grounds in the field of technical-maintenance and repair of electrical equipment used in science, engineering and manufacturing.

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